REMARKS

This is in response to the Office Action dated October 24, 2002. In view of the foregoing amendments and following representations, reconsideration is respectfully requested.

Initially, the specification and abstract have been reviewed and revised in order to make a number of minor clarifying and other editorial amendments. Note that the changes to the abstract are submitted in the form of a substitute abstract. Copies of the amended portions of the specification, claims and abstract, with changes marked therein, are attached and entitled "*Version with Markings to Show Changes Made*."

Further, the claims have also been amended to make several minor clarifying changes. Note that the scope defined by the original claims has not been narrowed by any of the above amendments.

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Next, in items 1-2 of the previous Office Action, the Examiner rejects claims 1, 3, 4 and 6-8 under 35 U.S.C. § 102(a) as being anticipated by Ohori et al. (U.S. Patent No. 6,446,806). The Examiner also rejects claims 2 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Ohori in view of the admission of prior art (APA) on pages 1-4 of the present specification. These rejections are respectfully traversed for the following reasons.

In the Office Action, the Examiner takes the position that the Ohori reference anticipates each of the independent claims, i.e. claims 1, 4, 7 and 8. However, a claim is

anticipated only if each and every element as set forth in the claims is found, either expressly or inherently described, in a single prior art refer nce. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). As will be demonstrated below, the Ohori reference clearly does not meet each and every limitation of claims 1, 4, 7 and 8.

Ohori discloses a transportation container and a method of opening and closing a lid 9 of the container. The lid includes a front retainer 11 having a pair of holding supports 13. As shown in Fig. 4, the holding supports 13 are provided with a plurality of support grooves 16 for supporting semiconductor wafers W so as to protect the semiconductor wafers W from friction, contamination, impact and vibration during transportation. Ohori also discloses a carrier unit 50 having a transportation mechanism 60 for moving a mounting base 64 back and forth between an operating region 61 and a supply/discharge region 62. When the container body 1 is mounted on the mounting base 64, a detector on the mounting base detects the container body, whereupon the opening and closing device for the lid 9 starts to operate in accordance with a predetermined program.

A careful review of the Ohori container indicates that the container body 1 does not have any electric device that would require a supply of electric power. Accordingly, the body (mounting base 64) of Ohori does not include a moveable power supply connector, or a control mechanism for bringing the connector into contact with a charging terminal of the container.

The present invention, as defined in claim 1, requires, *inter alia*, a movable power supply connector provided on said body; and a control mechanism for bringing said power supply connector into contact with a charging terminal of the substrate carrier container. Similarly, claim 4 requires, *inter alia*, a movable power supply connector provided on said body; and a control mechanism for bringing said power supply connector into contact with a power supply terminal of the substrate carrier container.

In the rejection, the Examiner takes the position that Ohori discloses a power supply connector (13), and a control mechanism (60) for bringing the power supply connector into contact with a charging terminal of the container to the rechargeable cell (62) in the container.

However, as discussed above, in Ohori the reference numeral 13 represents a holding support, and not a power supply connector. Furthermore, it is noted that the holding supports 13 in Ohori are provided on the lid of the container, and not on a body of a power supply apparatus. Also, it is noted that the supply/discharge region 62 of Ohori is not a rechargeable cell as suggested by the Examiner. Therefore, a "power supply connector provided on the body", which is recited in independent claims 1 and 4, is clearly not disclosed or suggested by the Ohori reference.

Independent claim 7 is directed to a method of supplying electric power to a substrate carrier container, and requires, *inter alia*, the steps of moving a power supply connector provided on said body so as to bring said power supply connector into contact with a charging terminal of said substrate carrier container; charging said rechargeable

cell in said substrate carrier container; and returning said power supply connector to an original position thereof after said rechargeable cell is charged. Similarly, independent claim 8 recites moving a power supply connector, provided on said body, to bring said power supply connector into contact with a power supply terminal of said substrate carrier container; supplying electric power to said electrical component; and returning said power supply connector to an original position thereof after the electric power is supplied to said electrical component.

Since the Ohmori mounting base 64 does not include a power supply connector and the container body 1 does not include an electric device, it is submitted that the Ohmori reference does not disclose or suggest any of the above-identified limitations of claims 7 and 8.

Further, in rejecting dependent claims 2 and 5, the Examiner applies the APA to teach a container having an electric device. However, the collective teachings of the applied references do not disclose or suggest a movable power supply connector on the body of a power supply apparatus. Accordingly, it is submitted that independent claims 1, 4, 7 and 8, along with their respective dependent claims, are clearly allowable over the prior art record.

In view of the above, it is submitted that the present application is now clearly in condition for allowance. The Examiner therefore is requested to pass this case to issue.

In the event that the Examiner has any comments or suggestions of a nature necessary to place this case in condition for allowance, then the Examiner is requested to contact Applicant's undersigned attorney by telephone to promptly resolve any remaining matters.

Respectfully submitted,

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POWER SUPPLY APPARATUS FOR SUPPLYING ELECTRIC POWER TO SUBSTRATE CARRIER CONTAINER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a substrate carrier container equipped with an electrically operable component, for temporarily storing or carrying a workpiece, such as a semiconductor substrate, a photomask, or a magnetic disk. More particularly, the present invention relates to an apparatus for and a method of supplying electric power from an external power source to a substrate carrier container, and to an apparatus for and a method of charging a secondary cell in a substrate carrier container.

2. Description of the Related Art

In many cases, highly hermetically sealed containers are used for carrying and storing substrates, such as semiconductor substrates or glass substrates, which are being fabricated in semiconductor fabrication factories. Such a highly hermetically sealed container basically serves to protect the stored substrates from contaminants that are present outside of the containers. Contaminants are also produced from the material of the container and the stored substrates, and attached to the inner surface of the container. Therefore, unless the container is frequently cleaned, the contaminants attached to the inner surface of the container tend to contaminate a clean substrate that is stored in the container and is to be differently processed in a next process. Those highly hermetically sealed containers are

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electric power from the external power source are connected and disconnected directly by an operator in many cases.

(3) Generally, a portable device and an industrial device equipped with a secondary cell cannot be operated continuously unless the secondary cell is charged. For example, a small lightweight device having a secondary cell, such as a portable telephone or an electrically operated toothbrush, is directly placed on a charger to charge the secondary cell in the device. Many connectors for connecting the portable device to the charger use a fixed leaf spring because the device is lightweight, the charging current is low, the device is placed directly on the charger by an operator, and the connector [have] has a low requirement for reliability.

(15) An industrial device equipped with a secondary cell tends to be large in size, consume a large current, and have a high requirement for reliability. Therefore, many industrial devices use sockets and plugs for connection to chargers. In the case where a connector in a device equipped with a secondary cell is not connected by an operator, i.e., the connector is connected by a robot or an automatic moving mechanism in an automated factory, for example, a highly reliable connection can be established only when the device has an accurate positioning mechanism and a highly durable connector. Since a medium-sized device or a large-sized device generally has a large space therein for a connector, the dimensions of the accurate positioning mechanism and the connector do not pose significant problems. However, a small-

sized device such as a substrate carrier container does not have a large space therein for a connector. Therefore, it is necessary to make efforts to establish a highly reliable connection within a relatively small space.

A substrate carrier container that accommodates twenty-five 8-inch substrates weighs about 5 kg, and a substrate carrier container that accommodates twenty-five 12-inch substrates weighs about 10 kg. In an automated semiconductor fabrication factory, a substrate carrier container is mechanically handled and transported by a transportation machine such as an automated guided vehicle (AGV) or an overhead hoisting transfer (OHT). When the substrate carrier container is transported and seated on a power supply apparatus with the use of such a transportation machine, there is a strong possibility that a connection terminal for connecting the substrate carrier container to the power supply apparatus is damaged due to the shock caused by seating action. Particularly, a spring-type charging connector is prone to be damaged in such an environment.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a power supply apparatus which can highly reliably supply electric power to a substrate carrier container equipped with a rechargeable secondary cell and an air cleaner energized by the secondary cell or a substrate carrier container equipped with an air cleaner energized by an external power source.

(1) Operation of the components of the power supply apparatus for charging the secondary cell in the substrate carrier container 10 will be described below. When the substrate carrier container 10 is transported to the power supply apparatus, for charging, with a transportation machine such as an AGV or an OHT, the substrate carrier container 10 is seated in a predetermined position on the body 15 through the guide members 16 and the positioning pins 17, as shown in FIG. 6. When the substrate carrier container 10 is seated in the predetermined position on the body 15, the seating detecting device 18 detects the seating of the substrate carrier container 10 on the body 15. Then, the seating detecting device 18 operates the lifting and lowering mechanism 20 to lift the connector 19 mounted on the upper end of the lifting and lowering mechanism 20. The connector 19 is brought into contact with the charging terminals 13 provided on the bottom of the substrate carrier container 10, [for] thereby starting ~~to~~ charg~~e~~ing of the secondary cell in the substrate carrier container 10. When the charging of the secondary cell is completed or the substrate carrier container 10 is moved according to a substrate processing sequence, the seating detecting device 18 is turned off, and then the connector 19 is lowered by the lifting and lowering mechanism 20. The connector 19 comprises a spring-type connector, which is susceptible to mechanical shocks. Therefore, the connector 19 is retracted downwardly when the substrate carrier container 10 is not seated on the body 15 or the power supply of the power supply apparatus is turned off. In the present

embodiment, the connector 19 is provided on the upper surface of the body 15. However, the connector 19 may be provided on the side surface or the like, as needed. The connector 19 is vertically movable in the present embodiment. However, the connector 19 may be moved in horizontal directions or oblique directions inclined relative to the vertical or horizontal directions. Alternatively, the horizontal movement, the vertical movement, the oblique movement, and the rotational movement may be combined with each other as needed.

The seating detecting device 18 may comprise a mechanical switch, a proximity switch, a photoelectric sensor, or the like. The mechanical switch is one of the most general detecting devices. The mechanical switch may comprise a push-button switch, a rotary switch, a slide switch, a joystick switch, a torque switch, or the like. A small-sized mechanical switch is also commercially available. The proximity switch detects approach of an object through a magnetic field or an electric field. The proximity switch, which is a non-contact-type detecting device, is effective in applications where an object to be detected is made of metal or nonmetal. The photoelectric sensor may comprise a diffuse reflection sensor, a mirror reflection sensor, a transmission sensor, or the like. The diffuse reflection sensor detects an object when the object is illuminated with light emitted from a light emitting element, and the light is diffused and reflected and partly returned to a light receiving element. In the mirror reflection sensor, light emitted from a light emitting element is reflected by a mirror and returned to a

light receiving element. The mirror reflection sensor detects an object when the light between the mirror and the light receiving element is blocked by the object. In the transmission sensor, a light emitting element and a light receiving element are positioned in separate positions. The transmission sensor detects an object when light between the light emitting element and the light receiving element is blocked by the object. One of the aforementioned switches and sensors may be selected in consideration of their dimensions, shapes, prices, and reliability levels.

(11) The connector 19 may comprise a fitting-type connector, a clip-type connector, or a contact-type connector. The fitting-type connector has such a structure that a plug and a socket are fitted into each other. The fitting-type connector is widely used with power supply cables and communication cables. The fitting-type connector is one of the most reliable connectors in applications where the plug is not frequently inserted into and removed from the socket. The clip-type connector is often used for temporary connection. The clip-type connector operates by clipping a conductor, and is less suitable for use as the connector 19 in the present embodiment. The contact-type connector generally has such a structure that a spring and a flat plate are brought into point contact with each other for conduction. The contact-type connector is effective in applications where only a small space is available for placing the connector. The spring of the contact-type connector may comprise a leaf spring or a coil spring, and many kinds of contact-type connectors with

leaf springs and coil springs are available. In the present embodiment, the fitting-type connector or the contact-type connector is more effective than the clip-type connector, and the contact-type connector is more preferable from the viewpoint of saving space.

The air cleaner incorporated in the substrate carrier container 10 will be described below. The air cleaner comprising a particle removal filter and an air blower including a fan motor is generally used to reliably reduce contaminants and widely used in a semiconductor fabrication apparatus or a clean room. The particle removal filter may comprise a coarse particle filter, a medium efficiency particulate filter, a high efficiency particulate air filter (HEPA filter), or a ULPA filter. The particle removal filter may be selected depending on the desired cleanliness level. A gas removal filter may also be used for the air cleaner. The gas removal filter may be made of an adsorbing or absorbing material depending on the substance to be removed. For example, an acid gas, a basic gas, boron, phosphor, or the like can efficiently be removed with the use of an ion exchange resin, an ion exchange nonwoven fabric, or impregnated carbon with an acid or an alkali. Organic substances can be removed with the use of activated carbon, activated carbon fiber, zeolite, molecular sieve, silica gel, or porous ceramics. Ozone can be removed with the use of a medium carried or impregnated with particulate or sheet-like manganese dioxide. A suitable gas removal filter of an adsorbing material may be selected depending on the substance

ABSTRACT OF THE DISCLOSURE

A power supply apparatus supplies electric power to a substrate carrier container having a rechargeable cell. The power supply apparatus [comprises] includes a body for seating a substrate carrier container thereon, a seating detecting device provided on the body for detecting whether or not the substrate carrier container is seated on the body [or not], and a power supply connector movably provided on the body. The power supply apparatus further [comprises] includes a control mechanism for bringing the power supply connector into contact with a charging terminal of the substrate carrier container to charge the rechargeable cell in the substrate carrier container according to a detected signal from the seating detecting device.

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1.(Amended) A power supply apparatus for supplying electric power to a substrate carrier container having a rechargeable cell, said power supply apparatus comprising:

a body for seating a substrate carrier container thereon;

a seating detecting device provided on said body, for detecting whether or not the [said] substrate carrier container is seated on said body [or not];

a movable power supply connector [movably] provided on said body; and

a control mechanism for bringing said power supply connector into contact with a charging terminal of [said] the substrate carrier container to charge [said] the rechargeable cell in [said] the substrate carrier container [according to] in accordance with a detected signal from said seating detecting device.

2. A power supply apparatus according to claim 1, wherein said substrate carrier container has at least one of an air cleaner and a dehumidifying device disposed therein.

3. A power supply apparatus according to claim 1, wherein said seating detecting device comprises at least one of a mechanical switch, a proximity switch, and a photoelectric sensor.

4. (Amended) A power supply apparatus for supplying electric power to a substrate carrier container having an electrical component energized by an external power source, said power supply apparatus comprising:

a body for seating a substrate carrier container thereon;

a seating detecting device provided on said body, for detecting whether [said] or not the substrate carrier container is seated on said body [or not];

a movable power supply connector [movably] provided on said body; and

a control mechanism for bringing said power supply connector into

contact with a power supply terminal of [said] the substrat carrier container to supply electric power to [said] the electrical component [according to] in accordance with a detected signal from said seating detecting d vice.

5. (Amended) A power supply apparatus according to claim 4, wherein [said] the substrate carrier container has at least one of an air cleaner and a dehumidifier disposed therein.

6. A power supply apparatus according to claim 4, wherein said seating detecting device comprises at least one of a mechanical switch, a proximity switch, and a photoelectric sensor.

7. (Amended) A method of supplying electric power to a substrate carrier container having a rechargeable cell, said method comprising:

seating a substrate carrier container on a body of a power supply apparatus;

detecting whether or not said substrate carrier container is seated on said body with a seating detecting device provided on the body [or not];

moving a power supply connector provided on said body so as to bring said power supply connector into contact with a charging terminal of said substrate carrier container;

charging said rechargeable cell in said substrate carrier container [according to] in accordance with a detected signal from said seating detecting device; and

returning said power supply connector to an original position thereof after said rechargeable cell is charged.

8.(Amended) A method of supplying electric power to a substrate carrier container having an electrical component energized by an external power source, said method comprising:

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seating a substrate carrier container on a body of a power supply apparatus;

detecting whether or not said substrate carrier container is seated on said body with a seating detecting device provided on the body [or not];

moving a power supply connector, provided on said body, to bring said power supply connector into contact with a power supply terminal of said substrate carrier container;

supplying electric power to said electrical component according to a detected signal from said seating detecting device; and

returning said power supply connector to an original position thereof after the electric power is supplied to said electrical component.

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